The USAF Manufacturing Technology

# PROGRAM STATUS REPORT

Wright Laboratory / Manufacturing Technology Directorate / Wright-Patterson AFB, Ohio
Visit the ManTech Homepage at: http://www.wl.wpafb.af.mil/mtx/mt_home.htm



Fall 1996

## NATIBO

The ***North American Technology and Industrial Base Organization (NATIBO)*** is an organization which strives to promote the technological industrial bases of both the United States and Canada. For a more in-depth explanation of this binational effort, see the story on Pages 6-7.

Manufacturing Technology Directorate (MT) successes begin on Page 2, with a ***Composite Manufacturing Process Control System*** effort which simplifies processes and reduces costs.

New in-roads in ***Supplier Practices*** are being examined by an MT Focused Study Team. Details on this are on Page 10.

***Dan Brewer*** was recognized for his outstanding efforts by being presented the ***Meritorious Civilian Service Award.*** See this story on Page 4.

***Small Business Innovation Research (SBIR) Program*** projects are important in meeting manufacturing technology needs. For information on this, see Page 5. Info on the ***DoD ManTech Website*** can also be found on Page 5.

MT's ***1996 Roadmap Review*** took place in July. See the story on Pages 8-9.

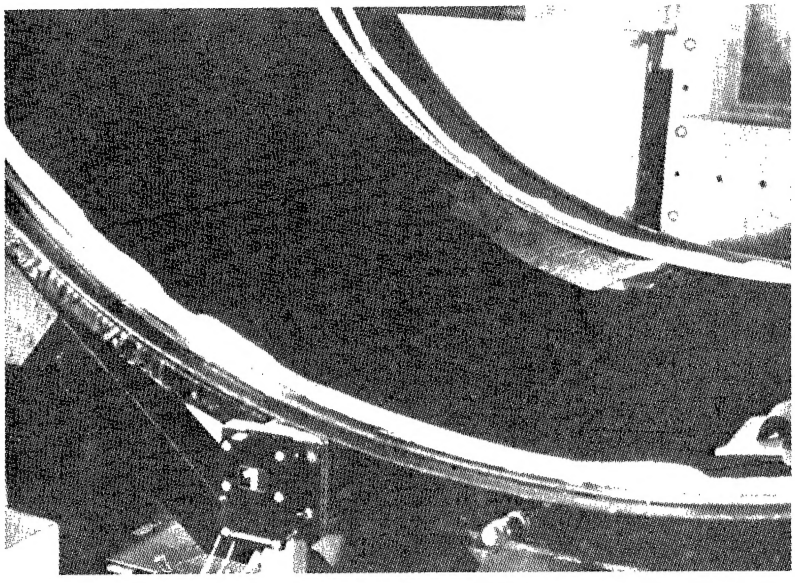
# Composite Manufacturing Process Control System reduces cost/simplifies process

A proof-of-concept Composite Manufacturing Process Control System (CMPCS) was produced which will reduce development and production costs of composite structures through reduction or elimination of tooling templates, process and inspection steps, production errors and scrap. By eliminating the need for template creation, storage, operation, maintenance and modifications (and all associated labor) a direct cost savings of $3,500 to $8,000 per month will be realized for a moderately complex hand layed-up part being produced on a full-time basis. The developed system also provides in-process quality control of the lay-up process thereby eliminating the need for quality inspections.

Under a Phase I Small Business Innovation Research (SBIR) contract with Assembly Guidance Systems, an integrated vision and laser projection system was developed to automatically deliver dimensional information directly from computer assisted design (CAD) data to provide in-process monitoring and documentation of correct sequence, location and orientation of the plies of composite material. The proof-of-concept system was developed at Assembly Guidance Systems, and then installed and operated in a production environment on an F-22 heavy gauge spar preform tool. The proof-of-concept system successfully demonstrated the ability to receive CAD data; dimensionally reference on tooling; display sequence, location, and orientation of plies; and automatically verify indicators of correct sequence, location, and orientation of plies.

Process controls are one of the key elements of building quality into an organic matrix advanced composite structure. Built-in quality reduces inspection, rework and scrap costs, increases reliability and results in lower overall acquisition costs. The majority of process controls investigated to date have focused on the curing process.

A recent study has shown that human error during the lay-up of composite parts such as mislocated plies, mistrimming, and placement of incorrect material can account for 36 percent of non-conforming parts in production. Rework and scrap are generally attributed to incorrect location and orientation of plies, foreign objects, and missing plies.



Almost all hand-laid composite parts created today are produced using templates to show the assembler where to place each component in the laminate. Templates are hard tooling and are the full size and shape of the part to be produced. One study has shown that the time required to handle the template is equal to the time required to place the actual composite material. Using templates to inspect for proper ply location and orientation is an expensive and cumbersome process. The template handling and deciphering time exceeds the time required for actual inspection.

The prototype system demon-

strated in Phase I of this effort eliminates the need for templates for ply location, orientation, and inspection. It also allows for automatic in-process quality monitoring.

The prototype system eliminates template creation, storage, operation, errors, maintenance and modification, and all associated labor by using the laser and vision system -- an inexpensive, easy-to-use, more accurate and flexible system. In-process monitoring catches production problems, not currently caught or caught at high cost, at the point where they can be resolved with minimal or no cost. Costs are reduced through scrap and rework reductions. Detailed documentation is created for each step with minimal cost.

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**F33615-95-C-5531**

For more information, circle Reader Response Number 1

# JDL Manufacturing Technology Panel to host DMC'96 in Miami

The 1996 Defense Manufacturing Conference will be held December 2-5, in Miami Beach, at the Fountainbleau Hilton & Towers. The conference will be hosted by the Joint Directors of Laboratories (JDL), Manufacturing Technology (MANTECH) Panel.

The JDL MANTECH Panel is chartered to identify and integrate requirements, conduct joint program planning, develop joint strategies and oversee the execution of MANTECH programs conducted by the Army, Navy, Air Force, Defense Logistics Agency and Defense Advanced Research Projects Agency.

The DMC provides an opportunity to discuss current manufacturing issues with representatives from academia, industry and government agencies. With the theme, "Issues and Challenges for the 21st Century," the conference will provide valuable insight into the future of defense manufacturing, paving the way towards future successes in the manufacture of both military and commercial products.

DMC '96 will be a forum for presenting and discussing initiatives which address DoD manufacturing needs. Participants will be provided an overview of defense manufacturing as well as detailed technical discussions relating to various initiatives and technology thrusts currently being pursued. The status of both government and industry programs will be presented, as well as a vision for the future of defense manufacturing, modernization and sustainment.

An estimated 700-800 people are expected to attend this year's event, as compared to the more than 650 people who attended last year's DMC in Dallas, in which the Wright Laboratory Manufacturing Technology Directorate was a key participant.

For more information, or to register, contact the Universal Technology Corporation, (513) 426-2808, or FAX (513) 426-8755.

# Manufacturing Technology Directorate engineer earns Meritorious Civilian Service Award

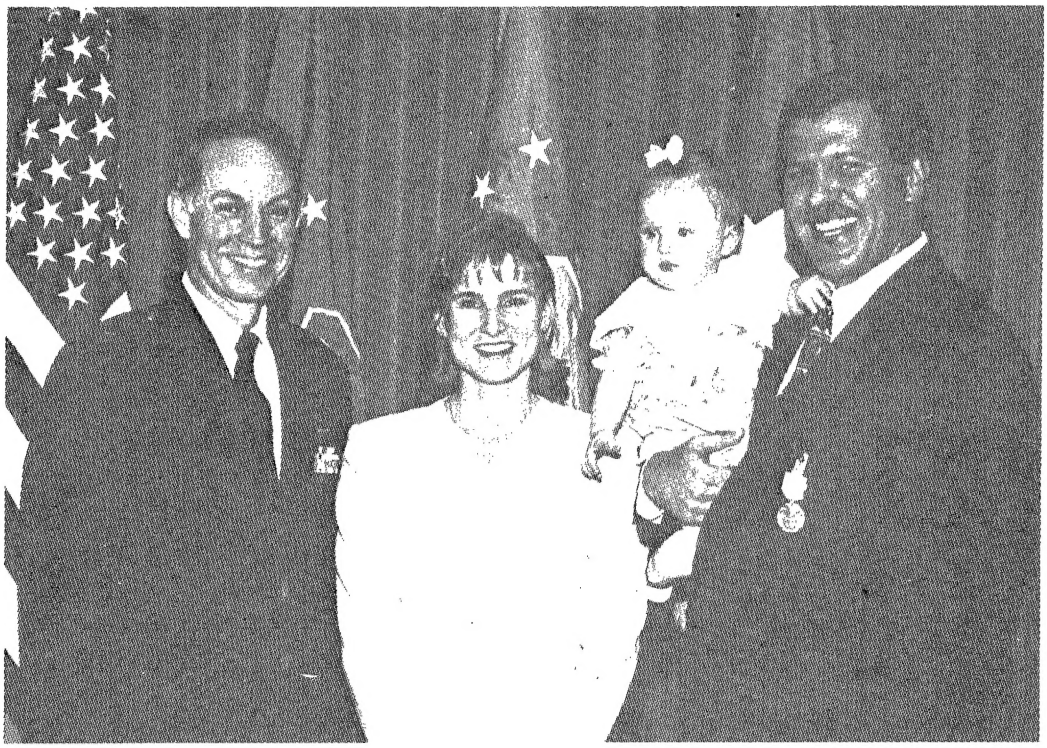
Daniel J. Brewer, a materials engineer in the Processing and Fabrication Division of the Manufacturing Technology Directorate at Wright Laboratory, has received the Meritorious Civilian Service Award.

He was commended for leading a team of more than 100 engineers, technicians, supervisors and managers in conducting Air Force Materiel Command's Sustainment 2005 Organic Industrial Base Assessment.

Maj. Gen Richard R. Paul, director of science and technology for AFMC, presented the award to Brewer, whose team created a baseline for the command's air logistics centers' current industrial capability for turbine engines, software, electronics, airframes, and commodities. The team also forecast future technological requirements, and developed a plan to bring the baseline in concert with future needs.

Brewer served as leader for the directorate's repair technology program, which involved identifying, planning and justifying the directorate's efforts in the ALC community. Winner of the 1994 Manufacturing Technology R. Lee Kennard Heritage Award, Brewer manages several programs in the Nonmetals Branch, including formulation of the Wright Laboratory Composites Affordability Initiative.

Dan and his wife, Trixie, live in Centerville with their one-year-old daughter, McKenzy.



***Dan Brewer with his wife, Trixie, daughter, McKenzy, and General Paul.***

# Program creates MT research opportunities

The ManTech Small Business Innovation Research (SBIR) Program is playing an important role in getting small business participation to meet Manufacturing Technology research and development needs, as well as enhancing the commercialization potential of these technologies. During FY96, Wright Laboratory's Manufacturing Technology Directorate (MT) managed approximately $6.8 million in SBIR contracts. These contracts are in direct response to topics generated by MT engineers. This creates a win-win situation for both the DoD and the small business.

Some examples of the innovative manufacturing research currently being conducted are:

- **Production Laser Peening Facility Development:** This project will develop one of the first-ever, state-of-the-art, laser peening systems which will enable superior fatigue life enhancement for turbine engine airfoils.
- **Composite Manufacturing Process Control System:** This system will reduce development and production costs of composite structures through reduction or elimination of tooling templates, process and inspection steps, production errors, and scrap.
- **Metal Forming Tool Design:** This software tool will enable designers to input part, and process data for sheet metal forming operations and have the tooling automatically created electronically.

For information on the SBIR Program and upcoming solicitations, contact the MT SBIR Manager, Marvin Gale, at (513) 255-4623.

Manufacturing Technology USAF

# DDR&E sponsors DoD ManTech Website

The Office of the Director, Defense Research & Engineering (DDR&E) is the sponsor for the DoD ManTechWebsite, which can be visited at: http://mantech.iitri.com/.

Since its debut in February of this year, the DoD ManTechWebsite has grown to over 300 pages of information relative to the DoD ManTech Program. This website contains information on what the program is, how it works, some of its successes, links to other sites of interest, including links to the DoD-sponsored manufacturing centers of excellence, and points of contact for further information.

Funding information available on the DoD ManTechWebsite includes the results of the FY96 budget deliberations and summaries of the latest Congressional committee reports on the FY97 budget. There are also publications and presentations available for on-line viewing or downloading, including the FY97 Defense Technology Area Plan (DTAP) for Manufacturing Technology, and the DMC '95 Quality Forum White Paper, which was published in early July.

The site's meetings and events pages are continually updated with the latest information available on the 1996 Defense Manufacturing Conference (DMC '96). Included there are details on the conference location and agenda, as well as instructions on registering for the conference and information for potential exhibitors.

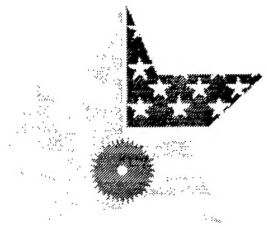
The site's" What's New" page is undergoing continuous improvement, and will keep people informed of changes and additions as they occur.

For more information, contact: Don Mackintosh, Production Technology, Inc., at (703) 271-9055, or via email at don.pti@bmpcoe.org.

# North American Technology and Industrial Base Organization

# NATIBO

## *"A forum for cooperation"*



NATIBO

Formally chartered in 1987 by the defense departments of the U.S. and Canada, the North American Technology and Industrial Base Organization (NATIBO) is committed to coordinating the technology industrial base activities of defense organizations and activities supporting North America. The organization strives to promote a cost effective, healthy technology industrial base that is responsive to the national and economic security needs of the U.S. and Canada.

Through this mandate, the NATIBO effectively leverages dollars and resources, capitalizing on scarce resources by reducing redundant efforts through tri-service/bilateral cooperation. The organization is able to garner high level government visibility and endorsement of technology and industrial base initiatives. Through their workplan, the group focuses on achieving rapid technology insertion and commercialization of emerging technologies.

The NATIBO fosters cooperative planning and technology industrial base program development and conducts analyses of technology industrial sectors to describe the strategic picture, including:

- the industrial base for this technology
- the research and development efforts underway
- current and potential markets
- what is needed to transition the technology to market and implement it in both defense and commercial systems
- facilitators and barriers to implementation

From this, a comprehensive roadmap of concrete initiatives is developed for enabling the sector to remain or become viable and advance in the current and projected economic environment.

The NATIBO has successfully conducted a number of these studies in such sectors as metal matrix composites, batteries, ion beam processing technologies, and collaborative virtual prototyping. Implementation for recommendations in these studies is also mapped out and executed.

As a result of the NATIBO's sector studies, insertion projects have been undertaken where the NATIBO has determined that the payoff of such an effort will help the technology pave the way towards commercialization and provide benefits to DoD systems. Currently underway is development of low-cost squeeze cast aluminum silicon carbide metal matrix composites for various military and commercial applications. The goals of this project are to achieve weight reduction of components and increased durability of manufactured goods, while providing operational benefits and cost savings.

An ion beam processing technologies insertion project has also been started to substantially improve the performance of ball bearings for rotary wing and fixed wing aircraft. Projected benefits to be gained through this project are increased lifetime of components, improved hardness and durability, improved corrosion resistance, and significant cost savings.

The NATIBO's work has spawned a number of collaborative efforts including cost-saving joint procurements. Sharing and exchanging information resulted in joint use of databases, insights into technological breakthroughs, and product and process improvements.

The NATIBO published its sector assessment of Collaborative Virtual Prototyping (CVP) technologies, to assess the maturity, level of use, utility and viability of CVP technology and its application to the industrial base.

CVP represents a collection of technologies

**To find out more about the NATIBO, visit their WWW home page at http://www.bdm.com/cvp/htm/natibo2.htm.**

that enable the establishment of an integrated and simulated acquisition environment. Integrated and simulated acquisition enables system developers, customers and end users to work as a distributed team to fully evaluate design concepts and conduct trade offs among design concepts prior to production.

Despite the apparent potential of CVP as a technology to support improvements in the weapon system process, numerous questions remain regarding the viability of this technology, concerning:

- integration of CVP into the acquisition process
- technological barriers in acquisition programs
- cultural and policy barriers associated with CVP technologies
- economics of implementing CVP and how this affects the government's ability to use small businesses at the prime and subtier level
- measurement of the benefits of CVP
- transition of industrial practices employing CVP to weapon system development programs
- acceptance of CVP technologies and practices within the defense development community

These issues are at the heart of this report, which encompasses the collection and analysis of technical, business, and policy information related to CVP research efforts and industrial capabilities in both the U.S. and Canada. Particular focus is placed on the challenges faced by small and medium sized organizations in applying this emerging technology. These factors were taken into consideration when the NATIBO developed a roadmap of actions to overcome cited barriers and make more widespread use of these technologies in both the defense and commercial sectors. The final report was released in June 1996.

The NATIBO has released its sector assessment on ion beam processing (IBP) technologies. IBP technologies have been identified as technologies which offer numerous benefits, including the potential to reduce lifecycle costs, enhance performance, and reduce the environmental problems associated with the use of cadmium or chromium. Over the past decade, ion implantation, the most visible IBP technology, has been able to find a technical and commercial niche improving the wear properties of medical devices such as titanium hip and knee joints. However, IBP technologies have not yet been able to successfully penetrate other North American markets despite successful demonstrations in many applications.

The NATIBO study identifies and assesses the maturity and applicability of IBP technologies to solve many metal surface finishing problems found in the North American industrial base. It highlights the benefits of IBP and current North American defense and commercial activities, as well as international activities, related to IBP technology development and use. It addresses the technological and socio-economic barriers preventing the adoption of IBP technologies in North America. The report then provides a roadmap of recommendations for government and industry to more fully capitalize on the potential of IBP technologies in the metal surface finishing industry sector. The final study report was completed in June 1996.

The IBP study has served as the impetus for several initiatives. As a result of recommendations put forth, the NATIBO convened a forum of IBP experts and interested government representatives to lay the groundwork for identifying possible military applications which could benefit from this technology for a potential insertion project. An IBP Insertion Program Working Group has been established to examine various components for an insertion program and determine which items are of highest interest and offer the most potential throughout all of the Services. An IBP Specifications and Standards Working Group is being established to concentrate on setting IBP commercial specifications and standards. In addition, information exchange programs are being set up to better educate potential users of IBP technologies and improve the exchange of information within the North American defense sustainment community.

**For further information on this report or other documents prepared by the NATIBO, contact**
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# 1996 Roadmap Review brings manufacturing officials up to speed on MT research efforts

Leaders from industry, government and academia gathered at the Dayton Convention Center July 18, for the Wright Laboratory Manufacturing Technology Directorate (MT) 1996 Roadmap Review.

The event provided participants insight into planned Air Force manufacturing technology research and development activities. It also provided an opportunity for participants to offer suggestions and ideas on future MT research and development activities.

Dr. William C. Kessler, MT director, told attendees about the directorate's vision to realize a responsive world-class manufacturing capability to affordably meet the warfighters' needs throughout the defense system life cycle. He also provided attendees with an overview of the directorate's mission and research and development efforts.

Dr. Kessler noted the directorate's many program accomplishments, highlighting the Sustainment Conference; the Diminishing Manufacturing Sources and Material Shortages Conference; the enhanced focus on Aging Aircraft; the Focused Supplier Team; the Lean Enterprise Model; the Partnering Model; and the Successful Business Case for Commercial Military Integration for F-22 Avionics Modules. The director also cited technical program accomplishments in Large Aircraft Robotic Paint Stripping; Integrated Toolkit and Methodology for Aerospace Manufacturing; Subcontractor Access to Prime Contractor CAD/CAM & Databases; Process Capability Methodology for Structure Design; Laser Particle Counter Sensor; and the Quality Pathfinder for Soldering.

The Roadmap Review is the directorate's opportunity to get representatives from industry together to let them know about Air Force manufacturing technology interests. According to Dr. Kessler, industry participation is key to the success of the directorate.

Dr. Kessler also discussed Integrated Program Strategy & Guidance, while other speakers throughout the day addressed different MT interest areas, including the direction of future programs in Metals/Non-metals Processing and Fabrication; Electronics Processing and Fabrication; Manufacturing and Engineering Systems; and Advanced Industrial Practices. MT officials also provided requirements definitions in the areas of aircraft; missiles and munitions; space & $C^3I$; and aerospace sustainment. The directorate also presented awards to its top performers at a luncheon during the review.

***Dr. William Kessler (center) joins award recipients (from left) Persis Elwood, Marvin Gale, Sally Morgan, and Tracy Houpt, following the Roadmap Review awards luncheon.***

*WL Commander Col. Richard Davis, presents Tracy Houpt with his award.*

*MT Director Dr. William Kessler presents Marvin Gale with his award.*

# Directorate's top performers recognized

The Manufacturing Technology Directorate of Wright Laboratory announced its annual "top performers" award winners at the directorate's 1996 Roadmap Review, July 18, at the Dayton Convention Center.

Joint winners of the Director's Award are Persis Elwood, electronics engineer, Electronics Division, and Marvin Gale, industrial engineer, Plans and Programs Office.

Winner of the R. Lee Kennard Heritage Award, which recognizes an engineer, industrial base specialist or manager displaying outstanding leadership and management qualities, is Tracy Houpt of the Nonmetals Branch, Processing and Fabrication Division.

The Clerical/Support Award winner is Sally Morgan, assigned to the Plans and Programs Office.

Persis Elwood, joint winner of the 1996 Director's Award, was honored for organizing the key Army, Navy, Defense Logistics Agency and Manufacturing Technology Directorate representatives into a tri-service working group on sustainment.

Marvin Gale, co-winner of the 1996 Director's Award, was honored for his key contributions in promoting the directorate's Small Business Innovation Research program.

Winner of the 1996 R. Lee Kennard Heritage Award, Tracy Houpt was honored for taking an active role in leading the Military Products Using Best Commercial/Military Practices pilot program.

Houpt was also cited for his role in leadership of the integrated product team for this program, promoting close coordination of program performance/monitoring reviews and briefings to industry, and direct involvement with the C-17 System Program Office.

Serving as management assistant for the directorate, Sally Morgan won the 1996 Clerical/Support Award for single-handedly keeping the MT Newsletter, a quarterly "what's happening" directorate publication, alive through a team of active reporters.

*Dr. William Kessler presents Persis Elwood with her award.*

# Assessing commercial supplier practices

The Wright Laboratory Manufacturing Technology Directorate recently established an internal Focused Study Team (FST) dedicated to supplier development and management. The team, composed of representatives from throughout the Directorate, is tasked with learning about leading edge supplier development and management practices in both commercial and defense industries, the business context in which the practices are applied, their benefits, industry wide trends in the area and key defense barriers. The knowledge gained from the team's efforts will be used to guide MT planning well into the future.

The FST formally began their work by organizing and conducting a highly successful workshop at Honda of America's plant in Marysville, Ohio. Honda is recognized as one of the best companies worldwide in supplier management and is a recent recipient of Purchasing Magazine's Medal of Excellence. Along with the FST members, approximately 50 Air Force, Navy, Defense Contract Audit Agency and key contractor personnel were given the opportunity to discuss the mechanisms that have made Honda such a success.

For more information, circle Reader Response Number 2

Building from the workshop, the FST began a series of 14-16 intensive industry site visits. The team's efforts are firmly rooted in the Lean Aircraft Initiative and the Lean Enterprise Model (LEM). They are using the LEM to help structure the interviews and provide a framework to consolidate the results.

These visits span the spectrum of commercial and defense, mechanical and electrical and small, medium and large companies. The site visits go much deeper than an exchange of briefings. The FST works with the company to be visited to arrange individual interviews with key personnel. A strong attempt is made to gain a broad, cross section of viewpoints from management, marketing procurement, engineering, manufacturing, information systems and quality. During the interviews, the team focuses on supplier development and management processes, the business context in which they are conducted, the interrelationships among them, and the metrics used to determine results and further modify behaviors. In addition, the role of a few, potentially high impact DoD technologies/strategies are also explored. These include: target costing; electronic data; interchange/electronic commerce; supplier qualification/certification; and strategic supply chain planning and scheduling.

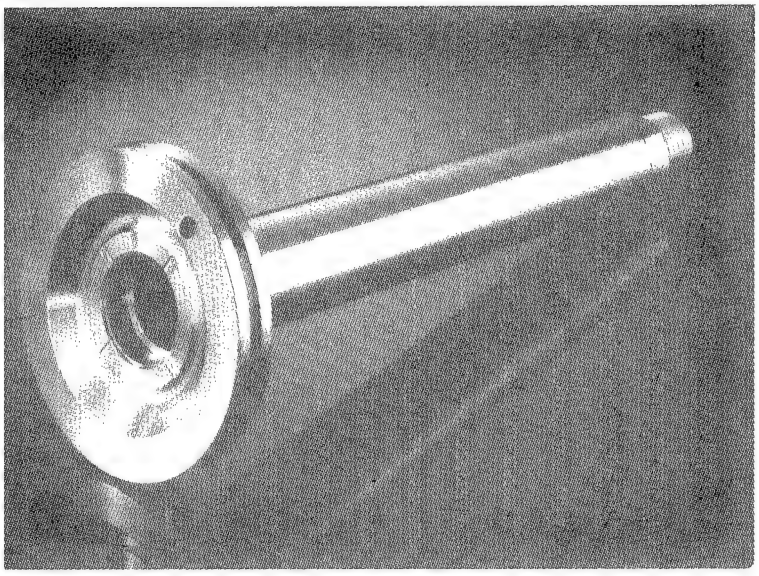
The FST will put the Air Force in a better position to develop supplier strategies by applying best commercial practices. Many commercial concepts and practices in purchasing from suppliers should be transferable (directly or indirectly) to the defense manufacturing environment. With over 60 percent of a weapon system comprised of purchased materials and components, realizable cost savings and quality improvements could be substantial. A full set of results of the efforts of the FST will be available during the 1996 Defense Manufacturing Conference, in December.

Manufacturing Technology USAF

# Two-dimensional nozzles result in Titanium Matrix Composite piston rod effort

The F-22 Engineering Manufacturing Development program has successfully demonstrated the capability of titanium matrix composites (TMC) with mechanical properties which exceed requirements by a factor of eight. Through the manufacturing technology program, engineers were able to develop a program which meets the manufacturing cost goal of $1,200 at the 500th unit for the TMC, as compared to $8,000 today.

The actuator piston rod will be the first application of TMC in a production weapon system. In February 1996, the F-22 System Program Office gave the approval to proceed to flight test The success of the program is directly attributed to the Integrated Product Team (IPT) technical management.



The two-dimensional nozzle in the Pratt & Whitney F-119 engine uses flaps to divert jet engine exhaust in many directions, increasing the performance and maneuverability of the aircraft. Two-dimensional nozzles are typically heavier than their symmetrical counterparts. To achieve the extraordinary maneuverability and speed response required for new generation aircraft, lightweight, high temperature components with high specific stiffness/strength are required. The objective of this effort was to establish an affordable manufacturing process which is readily scaleable to rate production for the fabrication of TMC nozzle components. As a result, the program reduced manufacturing costs and improved the reproducibility of TMC actuator piston rods for the F119 divergent flap. Through the IPT, all elements of the product's life-cycle, including quality, cost, schedule, and user requirements were considered. The information gathered guided the definition of a mature process technology path to facilitate the transition from advanced technology demonstration to production. The IPT is led by both the Manufacturing Technology Directorate and the F-22 System Program Office and includes members from Pratt & Whitney, Parker Aerospace, Atlantic Research Company, and the Wright Laboratory Materials and Propulsion Directorate.

For more information, circle Reader Response Number 3

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# JDL Manufacturing Technology Panel hosts conference on sustainment and repair

More than 300 people attended the 1996 Department of Defense (DoD) and Industry Conference on Sustainment and Repair Technology May 13-16, at the Red Lion Hotel in Seattle, Washington.

Hosted by the Joint Directors of Laboratories Manufacturing Technology Panel, the conference provided a forum for presenting and discussing initiatives aimed at sustainment/readiness and related defense and industry needs. This was the first time a defense-wide event of this nature had been held, and was an effort to bring all participants together to form an enterprise strategy to address common needs.

Following welcoming remarks by the Director of the Air Force Wright Laboratory Manufacturing Technology Directorate, Dr. William C. Kessler, attendees heard a DoD keynote address made by the Deputy Under Secretary of Defense for Logistics, retired Air Force Major General John F. Phillips. He was followed by a wide variety of distinguished speakers from throughout DoD, industry and academia, including RADM Arthur Clark, commander in chief, U.S. Atlantic Fleet; Col. David Duck, deputy director of Logisitics, HQ U.S. Air Forces Europe; and Col. Stephen Maness, assistant deputy chief of staff for Research Development and Engineering, HQ U.S. Army Materiel Command.

The conference was based on the theme of "Building a Partnership for Defense Sustainment" and provided insight into the future of defense privatization. Emphasis was placed on developing a long-term out-year sustainment enterprise strategy focusing on supporting aging systems. Other areas highlighted included parts obsolescence; business policies and practices (including Lean Logistics); supplier and environmental initiatives; human systems; and electronic commerce. The conference concluded with a tour of the Boeing Aircraft Manufacturing and Final Assembly Plant where their wide-body aircraft are made.

# DMSMS Conference held in Texas

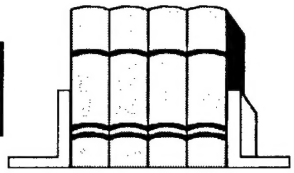
Over 300 people were at the 1996 Diminishing Manufacturing Sources and Material Shortages (DMSMS) Conference May 7-9, at the Del Lago Conference Center in Montgomery, Texas.

Sponsored by the Department of Defense and hosted by the Air Force, the conference provided a forum for presenting and discussing initiatives aimed at addressing issues across the spectrum of DMSMS concerns.

Highlighting the event was a DoD keynote address made by the Deputy Under Secretary of Defense for Logistics, retired Air Force Major General John F. Phillips. An Air Force keynote address was made by Wright Laboratory's Director of the Manufacturing Technology (MT) Directorate, Dr. William C. Kessler. MT's Jeff Smith, chief of the Defense Production Act Branch, and James Neely, Defense Priorities and Diminishing Sources program manager, directed the conference which featured exhibits and presentations from across DoD, industry and academia.

With the theme "Life Cycle Risk Management," DMSMS '96 was dedicated to enhancing interaction between government and industry to help solve challenging logistical and technical issues.

# Reports



**Mapping Successful Pathways for Labor-Managment Transformation Partnerships**

Alog Number: 3800
Contract Number: F33615-92-D-5812
Technical Report Number: WL-MT-072
Distribution: LIMITED

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**Missile Avionics Pathfinder**

Alog Number: 3801
Contract Number: F33615-93-D-4313
Technical Report Number: WL-TR-95-8022
Distribution: LIMITED

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**Titanium Matrix Composites Factory**

Alog Number: 3802
Contract Number: F33615-91-C-5728
Technical Report Number: WL-TR-94-8031
Distribution: LIMITED

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**Modeling of Doping Profile for FT-IR Based Control of EPI Silicon Layer Growth**

Alog Number: 3803
Contract Number: F33615-94-C-4443
Technical Report Number: WL-TR-95-8012
Distribution: LIMITED

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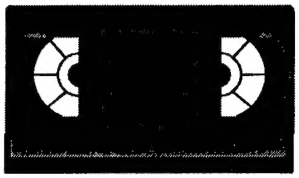
**Software Production Management**

Alog Numbers: 3807
Contract Number: F33615-92-D-5812
Technical Report Number: WL-MT-082
Distribution: LIMITED

# Videos



**Surface Inspection Tool**

Alog Number: 66
Length: 22:35
Distribution: LIMITED

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**Manufacturing Technology for Millimeter-Wave Impatt Diodes**

Alog Number: 70
Length: 15:12
Distribution: LIMITED

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**Manufacturing Technology for AN/FPS-Pave Paws Radar**

Alog Number: 71
Length: 13:40
Distribution: LIMITED

# Ordering

Wright-Patterson personnel or their contractors may contact the Wright Laboratory (WL) Technical Library, (513) 255-7415. They must be registered with the library in order to obtain reports. Classified or limited documents will be released only to the contract monitor.

Non-Wright-Patterson personnel who wish to obtain any WL documents, and are registered with the Defense Technical Information Center, should contact the center. To register call 1-800-CAL-DTIC.

To obtain unlimited/unclassified documents, contact the National Technical Information Service, (703) 487-4650.

For further information, or to order videos, call the Technology Transfer Center at (513) 256-0194.

# 14 *End of Contract Forecast*

| DATE | PROJECT TITLE CONTRACT NO. | PRIME CONTRACTOR | POINT OF CONTACT |
|---|---|---|---|
| September 1996 | Titanium Matrix Composite Piston Rods F33615-91-C-5731 | Atlantic Research Corporation Wilmington, MA | Siamack Mazdiyasni (513) 255-2413 |
| September 1996 | Complex Shaped Thermoplastics F33615-86-C-5008 | Lockheed Martin Corporation, Aeronautical Systems, Marietta, GA | Tia Benson Tolle (513) 255-9065 |
| September 1996 | National Industrial Information Infrastructure Protocols (NIIIP), F33615-94-2-4447 | International Business Machines Corporation Milford, CT | John Barnes (513) 255-7371 |
| September 1996 | Integrated Product Processing Initiative (IPPI) F33615-93-C-5319 | Raytheon Company, Missiles Systems Division, Tewksbury, MA | John Barnes (513) 255-7371 |
| September 1996 | EMPI for Maintenance-Free NiCd Battery F33615-93-C-4319 | Eagel-Picher Industries Incorporated Colorado Springs, CO | Troy Strouth (513) 255-2461 |
| October 1996 | Integrated Process Planning/Production Scheduling (IPPPS), F33615-95-C-5523 | Raytheon Company, Missiles Systems Division, Tewksbury, MA | James Poindexter (513) 255-8589 |
| October 1996 | Large Scale System Simulation & Resource Scheduling Based on Autonomous Agents F33615-95-C-5524 | Intelligent Automation Incorporated Rockville, MD | James Poindexter (513) 255-8589 |
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**Fall 1996**

The USAF Manufacturing Technology

# PROGRAM STATUS REPORT

**Fall 1996**

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